

AD-A238 112



NTATION PAGE

Form Approved
OMB No. 0704-0188

ited to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

REPORT DATE
April 1991

3. REPORT TYPE AND DATES COVERED

Final 21 Jan 91 - 20 Jan 92

4. TITLE AND SUBTITLE

1st International Conference on Frontiers of
Polymer Research

5. FUNDING NUMBERS

DAAL03-91-G-0057

6. AUTHOR(S)

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

State University of New York at Buffalo
Buffalo, NY 142148. PERFORMING ORGANIZATION
REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U. S. Army Research Office
P. O. Box 12211
Research Triangle Park, NC 27709-221110. SPONSORING/MONITORING
AGENCY REPORT NUMBER

ARO 28836.1-MS-CF

11. SUPPLEMENTARY NOTES

The view, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution unlimited.

12b. DISTRIBUTION CODE

*3. ABSTRACT (Maximum 200 words)

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14. SUBJECT TERMS

Polymers, Conference

15. NUMBER OF PAGES

9

16. PRICE CODE

17. SECURITY CLASSIFICATION
OF REPORT

UNCLASSIFIED

18. SECURITY CLASSIFICATION
OF THIS PAGE

UNCLASSIFIED

19. SECURITY CLASSIFICATION
OF ABSTRACT

UNCLASSIFIED

20. LIMITATION OF ABSTRACT

UL

91-05346

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Conference Report

Approved for
Distribution
DTIC TAB
Unannounced
Justification

**"1ST INTERNATIONAL CONFERENCE ON FRONTIERS OF
POLYMER RESEARCH"**

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On January 20 - 25, 1991, the "1st International Conference on Frontiers of Polymer Research" was held in New Delhi, India. It was organized by P. N. Prasad (SUNY at Buffalo), F. E. Karasz (U. Mass.), and J. K. Nigam (Shriram Institute for Industrial Research). The 225 participants represented 25 countries and a wide variety of academic, industrial, governmental, and political groups.

As shown in the accompanying photograph, the Prime Minister of India, Mr. Chandra Shekhar, inaugurated the conference, delivering a highly motivating speech praising recent development and achievements in the polymer field.

Several other dignitaries presented important speeches and addresses in this vein, focusing primarily on India itself. M. G. K. Menon, former Minister of State for Science and Technology,

discussed both polymer research and polymer applications. V. Gowariker, Secretary of the India Government's Department of Science and Technology and a well-known polymer scientist, gave a keynote speech addressing the lack of organized polymer and polytechnic education, but pointing out numerous advances in the field. N. Vittal, Secretary for the India Government's Department of Electronics, discussed the importance of the conference in regard to Indian Scientific Research. S. Pitroda, Chairman of Telecom Commission, India, spoke about the developments in the use of polymers in communications. Similar information on the state of polymer research in Indonesia was given by M. Sugandi Ratulangi of S and A Petrokimia, Indonesia.

The focus of the conference was on three important areas of polymer research: polymers for photonics, polymers for electronics, and high-performance polymers. The conference emphasized the cross-fertilization of these areas, which traditionally have been covered in separate scientific meetings. Review talks were presented on the first day, after the inaugural session, to familiarize people with developments in each area. A unique feature of the conference was the session on Emerging New Technologies, in which high-level industrial representatives from many countries presented their views on the applications of polymeric materials in new future technologies. In general, their talks reflected a great deal of optimism for applications of specialty polymers, and a real need for university-industry cooperation on facing the new challenges these areas represent.

In the photonics section, papers were presented relating to many key issues: molecular engineering for a specific non-linear optical (NLO) response, enhancement of second- and third-order NLO susceptibilities of polymers in different environments and configurations, and the possibility of fabricating second- and third-order NLO devices. These topics were all reviewed in a general lecture by P. N. Prasad. Other lectures focused on more specific items. Although these lectures were too numerous for all of them to be mentioned, some can be cited to give a flavor of the wide variety of research going on in this area. For example, there were presentations by L. Dalton (University of Southern California) on metallated ladder and macrocyclic polymers, N. Ogata (Sophia University, Japan) on thin-film systems, H. Nakanishi (Japanese Research Institute for Polymers and Textiles) on crystal engineering techniques, and V. P. Kathuria (Shriram Institute for Industrial Research, India) on some specific trends in the use of photopolymers in optics. Non-linear optical effects in conjugated films was covered by F. Kajzar (CEA/IRDA, France), conjugated polymers and copolymers by S. Lefrant (Institute de Physique et Chimie des Materiaux, France), polyacetylenes by N. Babu (Indian Institute of Technology, Bombay), and nitroaniline films by P. S. Ramanujam (Riso National Laboratory, Denmark).

In general, the emerging consensus was that while polymeric materials exhibited great promise in the area of photonics, two important areas of future development remained: (i) enhancement of third-order non-linear optical coefficients for all-optical processing of information, (ii) improvement of optical quality of these materials

by chemical design, and development of processing techniques which permit construction of low-loss optical circuits from polymeric materials. A promising new approach for optimizing these features was in fact mentioned. In it, sol-gel processing was used to form high-optical-quality composites consisting of an inorganic oxide and an organic polymer.

In the session on polymers for electronics, projects dealing with conductive polymers, polymer blends and alloys, piezoelectric polymers, polymer composites, rigid-rod polymers, and photoconductive polymers were described. A general talk involving the use of polymers in the electronics industry was presented by J. K. Nigam (Shriram Institute for Industrial Research, India). S. Chandra Sekhar (Raman Research Institute, India) talked about the physics and applications of liquid crystals in this area. Some examples of more specific talks follow. H. Naarman (BASF AG, Germany) gave a review lecture on conducting polymers, with detailed descriptions of various synthetic routes to these materials. S. Miyata (Tokyo University of Agriculture and Technology) discussed conducting polymer alloys, and N. Toshima (University of Tokyo) spoke on a novel synthesis of a pyrrole polymer using a cuprous catalyst. Spectroscopic aspects were the subject of the talk by H. Kuzmany (University of Vienna, Austria). S. Murthy (Allied-Signal, Inc., USA) discussed structural evolution in doped conjugated polymers, and M. J. Patni (Indian Institute of Technology, Bombay) described composites for capacitors and related devices. Piezoelectric polymers were discussed in papers by P. K. C. Pillai (Indian Institute of Technology, New Delhi), R. Chujo (Tokyo Institute of Technology), and

R. P. Singh (Indian Institute of Technology, Kharagpur), and Langmuir-Blodgett films by A. Yamada (Japanese Institute of Physical and Chemical Research) and S. Tripathy (Lowell University, USA). Polypyrroles were also the subject of papers by A. Techagumpuch (Chulalongkorn University, Thailand), F. L. Pratt (University of Oxford), S. K. Dhawan (Central Electrochemical Research Institute, India), and H. F. Chen (Taiwan Industrial Technology Research Institute). Polythiophenes were discussed by S. A. Chen (National Tsing Hua University, Taiwan), and polyemeraldines by D. Rodrigue (Notre Dame University, Belgium). Photoresists for submicron lithography were discussed by K. Miura (Mitsubishi Kasei Corporation).

In this area of conducting polymers, the emphasis was on the understanding of the mechanism of charge conduction and characterization of the effect of temperature. Notable progress was reported in the use of composites and blends to optimize mechanical properties, environmental stability and conductivity. From the applications perspective, T. Matsunaga reported that the Bridgestone Corporation of Japan is already marketing batteries which use conducting polymers. From the reports and discussions, it emerged that for further development of the field of conducting polymers, the major issues to be addressed are processibility and stability.

In the sessions on high-performance polymers, new developments in the science and technology of polymers were summarized by R. Darms (Ciba-Geigy, Switzerland). J. K. Yeo (Lucky Limited, Korea) lectured on "Recent Developments in High-Performance Engineering Plastics". J. E. Mark's talk focused on new

organic-inorganic composites with novel thermal and mechanical properties, and F. E. Karasz (U. Mass.) discussed new multifunctional polymer blends. Highlights included (i) novel composites, including those of an organic-inorganic nature, (ii) better molecular understanding of phase relationships in polymer blends by computer simulation; (iii) use of nematic liquid-crystalline phases to produce high-performance films and fibers of rigid-rodlike polymers, and (iv) use of chemical and polymeric approaches in the field of ceramics to produce novel advanced materials. Other active participants in this area included S. K. Gupta (Trivendrum Space Center, India), S. C. Kim (Korea Advanced Institute of Science and Technology), D. A. Dabholkar (Shriram Institute for Industrial Research), T. Tsujita (Nagoya Institute of Technology, Japan), I. K. Varma (Indian Institute of Technology, New Delhi), D. F. Ohishi (Kanagawa University, Japan), T. Kunugi (Yamanishi University, Japan), and K. Akkapeddi (Allied-Signal, Inc., USA).

The Conference was supported by a variety of agencies. The international organizations were: Air Force Office of Scientific Research (USA), National Science Foundation (USA), International Center for Theoretical Physics, Italy (UNESCO), European Office of Aerospace Research & Development (UK), Army Research Office (USA), Foster Miller, Inc. (USA), Hoechst-Celanese (USA), Allied-Signal (USA), Unitika, Ltd. (Japan), Lucky, Ltd. (Korea), Loctite (Ireland), I. C. I. (UK), and B. P. America. The national (Indian) organizations were: Department of Electronics (Government of India), Indian Petrochemicals Corporation, Ltd., Shriram Rayons (Kota), Uniplas India, Ltd., Shriram Fertilizers & Chemicals (Kota),

LML Fibers, Ltd., National Organic Chemical Industries, Ltd., Polychem Ltd., Pearl Polymers, Ltd., Shivathene Linopack, Ltd., Synthetics & Chemicals, Ltd., Nulab Equipment Company Pvt., Ltd., Spectronic Instruments (I) Pvt., Ltd., Techno Instruments, Nucon Engineers/AIMIL, Nuchem Plastics, Ltd., Gujarat Binil Chemicals, Ltd., and Automatic Electric, Ltd.

As shown in the second photograph, there was very active participation by Indian scientists and industrialists. Many participants from a variety of countries expressed the opinion that another area of interest and importance is the environmental impact inherent to polymer "life cycles". Since it was not covered in this conference, the suggestion was made that the second international conference consider including a session on this topic.

On two of the evenings, relevant discussion groups were organized, with I. Ahmad (US Army Research Office for the Far East, Japan) serving as discussion leader. The first focused on technologically relevant issues and collaborative programs, with strong support for US-India cooperation in these fields. The second discussion dealt with the prospect of a Second International Conference. The consensus was strongly in favor of holding such a conference, which would again focus on specific issues of current importance. It was also suggested that in this conference, formal discussion panels be organized to discuss important issues, bring them into focus, and make recommendations. These panels would consist of industrial and academic representatives, and would discuss both technology-oriented and fundamental problems.

The conference provided points of interest beyond science. Each evening the participants were treated to cultural and social events, including various exhibits and a fashion show. As shown in the third photograph, a life-sized Indian village was recreated to encourage a fuller understanding of Indian lifestyles. Sightseeing tours were made available throughout the entirety of the conference.

The 1st International Conference on Frontiers of Polymer Research was a phenomenal success. Suggestions from interested parties regarding the second conference, to be held in January of 1993, are strongly encouraged.

Legends for Photographs

The Prime Minister of India, Mr. Chandra Shekhar, inaugurating the 1st ICFPR.

The session on emerging new technology at the 1st ICFPR.

"Little India" - a life-size creation of an Indian village for ICFPR participants.

THE FIRST INTERNATIONAL CONFERENCE ON FRONTIERS OF POLYMER RESEARCH



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